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Comments from M. Karol and J. Stover (DOE) on the Draft Title II Drawings and Technical Specification, August 29, 1995.

Comment 1: *An idealized scenario (clean, initial conditions) was used to determine the system operating parameters, as demonstrated in the design calculations for head loss in pipes in Appendix A, section 4. The head loss was actually calculated in section 4 for the whole system under clean, initial conditions. Potential operating conditions carrying a particulate load, which could result in a significantly greater head loss, apparently were not considered.*

Response: An idealized scenario had to be used to determine the initial system operating parameters for lack of an acceptable alternative method that considers particulate load. The idealized scenario provides estimates for initial, optimal conditions and head losses through the system. The head loss will increase over time and the filters will have to be changed out. However, it is not possible to estimate when the lead loss will be unacceptable and when change out will be required with any degree of certainty because applicable methods for estimating these parameters are not available. In addition, the sedimentation tank is designed to remove most of the particulates that would cause significant clogging and head loss. As a result of the constraint that the design must be passive, the design is not standard and the system will essentially be a field-scale pilot test. The head loss and change out times must be determined in the field.

Comment 2: *Process units ill-suited to low-head gravity operations have been selected using assumptions and extrapolations about their expected performance. Filter bags are typically used with pressurized or high-head systems which have the capability to force water through the bags as they collect.*

Response: The process units might or might not be ill-suited to low-head gravity operations. As a result of the constraint that the design must be passive, the design is not standard and assumptions and extrapolations regarding process units had to be made. The 10% capture rate is based on Figure 22.5 from Urbonas and Stahre, which indicates volumes of different size particles after two hours. The 90% reduction in bag capacity is arbitrary. However, the units should work adequately for this application. Bag filters

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were selected over cartridge filters because of higher capacity and lower head loss. Actual performance will not be known until the system is implemented. Removal of the filter bags is a possibility, but this will probably cause clogging of the carbon filters sooner and require change out sooner. Are alternatives that are better than the filter bags available?

Comment 3: *The proposed treatment system has high operational complexity relative to other passive systems. Use of the biocide and anit-scaling agent illustrate several potential system problems. Besides adding to the operational complexity of the system, it indicates a recognition that the system will become clogged or fouled without the chemicals. Also, an estimated usage rate for these chemicals to meet the variable conditions apparently has not been determined.*

Response: Besides the biocide, the greatest operational complexity is the change out of the filter bags. This is required due to the potentially high solids loading to the units.

Additional discussions with several engineers and vendors have led to the conclusion that the extent of bacterial and scale buildup is uncertain and is likely to be limited. Although some oxygen is present in the system, no light is available to enhance bacterial growth. Rather than continuously dosing the system, a more conservative approach is to monitor the growth of bacteria by testing the effluent using "bacteria bottles" and visually inspecting the filters. If bacteria is detected at an unacceptable level, the system can be dosed with biocide.

Monitoring of bacteria levels in the effluent should occur regularly. If the level of bacteria becomes unacceptable, the system can be dosed with sufficient biocide solution to raise the biocide concentration in the settling tank to approximately 200 ppm, then added at a lower rate for approximately 24 hours. A 24-hour dose should be sufficient to exterminate the bacteria population.

The biocide and scale preventer includes an organic surfactant. It is designed to inhibit bacterial growth and reduce the buildup of iron deposits. The attraction of biocide to granular activated carbon is limited; therefore, much of the biocide and surfactant in solution would remain in the effluent. There are no ARARs for the compounds listed in the MSDS. The absence of ARARs and the high reportable quantity for spills are indicators that the compounds are not harmful to the environment. These compounds are light alcohols and ethers and should break down quickly in the environment. However, there is potential for localized and short-term bacterial inhibition in the area near the outfall.

Comment 4: *Finally, we believe the system will not meet Applicable or Relevant and Appropriate Requirements (ARARs) for a number of constituents (i.e. manganese, zinc, chloroethane, methylene chloride, vinyl chloride) found in the leachate. We expect a large percentage of these constituents will pass through the treatment system. The system should be optimized to improve performance to meet the greatest number of ARARs possible.*

Response: The leachate treatment system might or might not meet ARARs. However, ARARs do not have to be met for an interim action. The proposed system is designed to strive to meet ARARs. Constituents mentioned in the comments are addressed as follows:

Manganese - The ARAR for manganese (50 µg/L) is consistently exceeded. The mean concentration of manganese in leachate is 1623 µg/L. However, the mean concentration of manganese in background samples is 3,024 µg/L, which exceeds the ARAR and the concentration in landfill leachate. Manganese was rejected as a chemical of concern in groundwater at OU 1 using professional judgment. Manganese oxides and hydroxides are common weathering products in arid environments and have been described in bedrock from Rocky Flats (1992 and 1995 Geologic Characterization Reports). Because manganese is detected at higher concentrations in background samples than in leachate, manganese should not drive the remediation.

Zinc - Figure 3 shows measured zinc concentrations over time. Zinc concentrations have been decreasing steadily through time and most recent values are approximately equal to the ARAR (2,000 µg/L). As a result, it is likely that the ARAR for zinc will be met.

Chloroethane - The ARAR for chloroethane is uncertain. There is no ARAR for chloroethane in Table 1 (Appendix A of the OU 7 Technical Specifications). The ARAR for chloroethane is 5 µg/L in Table 2-2 of the Modified Proposed Action Memorandum. However, this is the ARAR for carbon disulfide and the numbers were likely transposed. The TBC for chloroethane is 270 µg/L in the Draft Rocky Flats ARARs (Proposed Performance Standards) document. However, the sitewide ARARs document has not been finalized. The mean concentration of chloroethane is 22 µg/L, which is less than the TBC. As a result, it is likely that the TBC for chloroethane will be met. Because the ARAR for chloroethane is uncertain, chloroethane should not drive the remedial design.

Methylene chloride - Detections of methylene chloride have been reported in 9 of 20 samples. Of these nine detections, two are outliers. The maximum concentration of methylene chloride in the remaining samples is 11 µg/L. Many of the detections are 1990 data that were never validated and are "B" qualified (detected in laboratory blanks). In addition, methylene chloride was detected in 26 percent of background groundwater samples. The maximum detection in background samples was 31 µg/L. The mean for the background data set is 21 µg/L Concentrations of methylene chloride in background samples exceed the ARAR (4.7 µg/L). Therefore, methylene chloride should not drive the remediation.

Vinyl chloride - Detections of vinyl chloride have been reported in 5 of 20 samples. Three of five detections are 1990 data, collected when sampling protocols were not as strict, and are unvalidated. The mean concentration is 5 µg/L. The ARAR is 2 µg/L. Because the presence of vinyl chloride is not certain, vinyl chloride should not drive the remedial design.